

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)	
)	
Wireless E911 Location Accuracy)	PS Docket No. 07-114
Requirements)	
)	
Public Safety and Homeland Security Bureau)	DA 13-1873
Announces Workshop on E911 Phase II)	
Location Accuracy Workshop)	

COMMENTS OF VERIZON AND VERIZON WIRELESS

Verizon and Verizon Wireless (“Verizon”) support the Commission’s efforts to address the complex technical challenges to improving the location accuracy for 911 calls made from indoors. The Commission can most effectively do so by supporting and learning from the efforts of the recently-chartered Communications Security, Reliability and Interoperability Council IV (“CSRIC IV”) Working Group. That group has been expressly tasked with establishing a permanent public test bed that will provide the Commission “with regular comprehensive, unbiased and actionable data on the efficacy of location technologies.”¹ As discussed below, Verizon is committed to enhancing the public safety benefits its wireless services already provide to consumers by meeting those challenges through the widespread and cost-effective deployment of innovative, tested, standards-driven E911 location accuracy solutions. Verizon’s robust Assisted-GPS (“A-GPS”) technology provides a sound technological foundation for improving indoor accuracy, and Verizon is already implementing improvements to A-GPS and

¹ See CSRIC IV *CSRIC IV Working Group Descriptions and Leadership* (Sept. 4, 2013 version), http://transition.fcc.gov/bureaus/pshs/advisory/csrc4/CSRIC_%20IV_Working_Group_Descriptions_%2009122013.pdf.

evaluating additional ones. Commission policies should facilitate, not derail, the deployment of technically feasible, economic indoor accuracy solutions that harness the capabilities of new location technologies. To that end, the Bureau should use its October 2nd Workshop to re-orient industry (service providers and vendors alike), public safety and government stakeholders toward a fact-driven assessment of how to effectively improve E911 indoor location accuracy for consumers.²

I. ASSISTED-GPS TECHNOLOGY PROVIDES CONSUMERS WITH ACCURATE, RELIABLE E911 PHASE II SERVICE AND A SOLID FOUNDATION FOR IMPROVING INDOOR LOCATION ACCURACY

In its comprehensive response to the California Chapter of the National Emergency Number Association (“CALNENA”) earlier this month, Verizon described its high level of Phase II location information delivery and explained why its Phase II service was fully compliant with Commission rules.³ Verizon’s performance reflects a longstanding, demonstrated commitment to improving location accuracy and public safety for its customers, and this commitment applies to Phase II accuracy as well. In the early days of Phase II implementation, Verizon decided to switch from a less accurate network-based solution to the more accurate A-GPS solution when A-GPS’s superior accuracy – particularly in rural and other areas with lower

² See Public Notice, *Public Safety and Homeland Security Bureau Announces Workshop on E911 Phase II Location Accuracy Workshop*, PS Docket No. 07-114, DA 13-1873 (PSHSB rel. Sept. 9, 2013) (“*Public Notice*”).

³ See Letter from Nneka Chiazor, Verizon, to Marlene H. Dortch, Secretary, Federal Communications Commission, PS Docket No. 07-114 (filed Sept. 11, 2013) (“*Verizon September 11th Letter*”). Verizon will continue to work with CALNENA and the PSAP community to ensure high quality location service, but as Verizon explained in its letter CALNENA’s report did not identify any issues with Verizon’s Phase II service. Instead, the report highlighted potential issues with PSAPs’ location bid and re-bid practices. CALNENA’s findings also do not address indoor location accuracy. Public safety and the public interest are better served if stakeholders focus their resources on the latter, and Verizon’s comments accordingly relate to those aspects of the *Public Notice*.

cell site density – became apparent. Verizon did so despite the regulatory compliance and handset marketing challenges that decision entailed. Verizon proceeded to sell over 55 million A-GPS handsets in the first four years of the E911 Phase II mandate, and has sold hundreds of millions since then. Verizon has also timely deployed E911 Phase II service to thousands of PSAPs, and worked collaboratively with them and the Commission to resolve technical questions and other issues and concerns that have arisen.

Importantly for indoor call location issues, Verizon’s A-GPS Phase II solution does not rely solely on GPS signals. Using Advanced Forward Link Trilateration (“AFLT”) techniques, this solution combines the benefits associated with both handset- and network-based technologies to provide a solution that is both accurate and timely. First, it attempts to generate a pure GPS location fix using data from multiple satellites, which provides the most accurate location. If a sufficient number of GPS satellites are not in sight, it uses a combination (“hybrid”) of GPS and AFLT to locate the caller. Lastly, a pure AFLT fix, which is now comparable to the location accuracy required for network-based solutions, is used as the final fallback. Only if these mechanisms do not produce a location that is sufficiently accurate does Verizon make Phase I location information available to the PSAP as the default.

Verizon has also proactively improved the accuracy of its A-GPS solution over time. It has worked with its chipset vendor to improve the sensitivity of GPS chipsets to satellite signals, which increases the likelihood that the handset will detect more satellites and thereby improves the accuracy of the location fix. Verizon has also continually updated the network-based cell site data within its control that, in turn, enables hybrid and AFLT techniques to generate more accurate fixes. And AFLT has become increasingly accurate over time as Verizon has worked with vendors to optimize antenna placement and base station information.

The result of these efforts is a robust Phase II location technology that provides a timely and accurate E911 solution today and a framework for future accuracy improvements for indoor and outdoor 911 calls alike. As Qualcomm recently explained to the Commission, A-GPS *does* provide a high yield of Phase II fixes for indoor 911 calls,⁴ and while indoor location accuracy remains particularly challenging in urban areas, the Commission should be wary of exaggerated or unsupported assertions regarding the current state of E911. For the five PSAPs covered by the CALNENA report, for example, Verizon previously reported that it transmitted Phase II data for the PSAPs to retrieve from the Mobile Positioning Center for 91-95 percent of all 911 calls – a figure that *includes* calls from non-service initialized handsets, handsets from subscribers and roamers that may not be A-GPS capable, even some prank calls, and, notably, indoor calls.⁵

In addition, Intrado's data indicates that 79-95 percent of those 911 calls – an overwhelming majority – involved either a pure GPS or hybrid fix, and 2-15 percent a pure AFLT fix. While Intrado's data does not distinguish between pure GPS and hybrid fixes, Verizon's internal data, which measures Phase II fixes on a county-wide basis, indicates that for the counties encompassing each of the five PSAPs, of all calls for which a Phase II fix was provided an average of 86 percent included a pure GPS fix, 4 percent hybrid, and 10 percent pure AFLT. (As one might expect, the highest percentage of AFLT fixes were in San Francisco, with its challenging urban environment and topography.)

While these figures affirm the engineering realities facing all RF-based location technologies in challenging environments, they also underscore how Verizon's comprehensive approach to Phase II compliance – using both handset- and network-based technologies – works

⁴ See Qualcomm *Ex Parte* in PS Docket No. 07-114, filed Aug. 14, 2013, at slides 4-5; CSRIC III Working Group III, Indoor Location Test Bed Report, at 25-36 (“*CSRIC III Report*”).

⁵ See Verizon September 11th Letter at 6-7.

to address them. As discussed below, enhancements to A-GPS and other location technologies under development by Verizon and its vendors for VoLTE service will enable service providers to improve indoor location accuracy in a manner that will effectively and efficiently leverage the existing A-GPS configuration.

II. VERIZON IS ALREADY IMPLEMENTING PHASE II E911 TECHNOLOGY THAT WILL FURTHER IMPROVE INDOOR LOCATION ACCURACY AND MORE IMPROVEMENTS ARE UNDER DEVELOPMENT.

In the *Public Notice*, the Bureau asks whether trends relating to consumer calling patterns, indoor usage, carriers' location technologies, and calling environments have affected Phase II location accuracy.⁶ Given the findings and recommendations of the CSRIC III Working Group 3 report, data already in this docket, and the well-known capabilities and limitations of existing location technologies, there is no need to debate the simple fact that each of these trends will affect the accuracy of the Phase II data transmitted to PSAPs, particularly in urban areas. Instead, the Commission should focus on establishing a policy framework that will enable consumers, service providers and PSAPs to harness the capabilities of new IP-enabled technologies and radio access network configurations to meaningfully improve Phase II accuracy for indoor 911 calls.

To that end, Verizon continues to lead industry's efforts to assess new location technologies and improve the accuracy of existing ones, including for indoor 911 calls. Verizon chaired the CSRIC III Working Group 3, and both it and its A-GPS vendor Qualcomm participated in the test bed efforts. While not all solution vendor working group members chose to participate in the test bed, that working group provided a candid assessment of the limitations

⁶ See *Public Notice* at 2-3.

of then-available technologies for the vendors that opted to participate.⁷ Verizon will continue to support efforts in the new CSRIC IV working group to establish a permanent test bed, which should supply new data about the capabilities and limitations of the Phase II location technologies that will be available. The permanent test bed will also give vendors that did not participate in the CSRIC III test bed testing another opportunity to do so.

Independent of the CSRIC IV initiative, Verizon has supported and will implement further improvements to A-GPS E911 for its forthcoming VoLTE offering. These improvements include supplementing GPS satellite location data with GLONASS satellite data (the “A-GPS/A-GNSS” technology) to increase the number of satellites and the quality of the available satellite-based location information. This, in turn, will increase the likelihood of a pure and highly accurate “satellite-based” location fix, including, to some degree, in indoor environments.⁸

Further, 911 calls from VoLTE handsets will utilize Observed Time Difference of Arrival (“OTDOA”) instead of AFLT as the network-based fallback location technique. OTDOA is designed to outperform AFLT due to higher LTE bandwidth, improved hearability (i.e., the handset’s ability to obtain distance measurements from multiple base stations), and more advanced processing. OTDOA should continue to improve as Verizon deploys additional LTE cell sites for capacity, notably in the very urban areas where indoor accuracy challenges are particularly acute.

⁷ See *CSRIC III Report* at 55; TruePosition Comments in PS Docket No. 07-114, filed August 6, 2013, at 18 (“Due to various contractual and practical challenges, TruePosition was unable to make its UTDOA system available in time for CSRIC’s testing in the San Francisco/Bay Area”).

⁸ See Qualcomm Presentation, FCC Workshop on Upcoming Test Bed to Improve Indoor Location Accuracy for Wireless 911 Calls, at 4 (Oct. 24, 2012) (describing advantage of supplementing GPS constellation with GLONASS), http://transition.fcc.gov/bureaus/pshs/docs/summits/911%20Location%20Acuracy/Cormac_Conroy.pdf.

These efforts will be coupled with Verizon's plans to deploy LTE-equipped handsets and VoLTE service.

New location solutions that harness the latest developments in radio access network technologies, moreover, have the potential to improve indoor location accuracy in a manner that effectively removes the mobility of the handset as a prohibitive factor in determining the caller's location and increases the potential for vertical location information. For example, as Qualcomm recently explained, indoor small cell deployments, WLAN location information, and hotspot or femtocell technologies, all of which can be designed with a very small coverage area, have the potential to provide very accurate location information via the equivalent of a "Phase I" location fix.⁹ Commission policies should accommodate these and other new technologies, which are at varying degrees of development, standards compatibility and commercial availability.

III. COMMISSION POLICIES SHOULD FACILITATE THE TIMELY AND ECONOMICAL DEPLOYMENT OF TECHNICALLY FEASIBLE E911 INDOOR LOCATION TECHNOLOGIES

As described above, the most important step the Commission can take to promote industry's and public safety's implementation of new and effective location accuracy solutions is to facilitate the continued testing of location technologies through a permanent CSRIC-established test bed. This will provide an added level of certainty for service providers, their customers, and the PSAPs that serve them that a chosen E911 location solution has been tested and its limitations understood.

In addition, as service providers, vendors, and public safety stakeholders have all acknowledged, testing methodologies for indoor 911 calls will necessarily differ substantially

⁹ See Qualcomm August 2013 *Ex Parte* at Slides 10-11.

from those used for outdoor 911 calls. As the CSRIC III Working Group 3 public safety participants explained:

[W]ide-spread indoor accuracy testing is not practical, considering the challenges with building access, logistics and time required to perform and analyze the test results as encountered in the current Test Bed. A process of small-scale test beds and statistical sampling mutually designed and agreed upon by Public Safety, location determining equipment vendors and wireless carriers will most likely provide the best vehicle for future studies.¹⁰

The test bed process will be useful in this regard as well by helping to establish reasonable parameters to guide service providers' own ongoing compliance tests.

The Commission should also ensure that any accuracy and reliability requirements governing 911 calls from indoor locations incorporate deadlines and substantive requirements that are technically feasible and practicable, reflecting the limitations of mobile wireless location technologies and the commercial availability of those solutions from vendors.¹¹ Phased-in implementation through milestones that account for consumer demand and manufacturer capabilities are appropriate. The Commission should not compel service providers to deploy legacy or proprietary location technologies with only marginal short term impact on consumers' E911 experience, to the detriment of more innovative and accurate solutions. Solutions that are not standards-based, or not designed to be incorporated efficiently into existing and future networks, may not function properly or reliably on an end-to-end basis, and at minimum risk diverting personnel and financial resources from solutions or efforts that will more effectively meet consumers' public safety needs. And any such solutions should be competitively and

¹⁰ See *CSRIC III Report* at 9.

¹¹ *Nuvio Corp. v. FCC*, 473 F.3d 302, 303 (D.C. Cir. 2007) (adequate consideration of "the technical and economic feasibility of" interconnected VoIP E911 deadlines was "made necessary by the bar against arbitrary and capricious decision-making").

technology neutral. For example, the Commission should not effectively preclude the use of location accuracy technologies that depend in part on handset-based technology, such as A-GPS/A-GNSS and NextNav, by imposing a flash-cut deadline for meeting any new more stringent requirements. Finally, the Commission can provide some additional legal and regulatory certainty in this area by affirming T-Mobile's long-pending petition for clarification that these new and existing technologies are and will remain permissible under the Commission's VoIP E911 rules.¹²

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¹² See T-Mobile Petition for Clarification in WC Docket No. 05-196, filed July 29, 2005.